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Prepped by Ryan Dugan

Document Number:

7) II-B.1

Docket Number:

A-87-06



A-87-06 *Stan A.*
II; B.1

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

JUL 18 1984

MEMORANDUM

SUBJECT: Impact of Proposed SO₂ Significant Harm Level

FROM: William F. Hunt, Jr.
Chief, Data Analysis Section, MDAD (MD-14) *William F. Hunt Jr.*

TO: John Bachmann, Environmental Engineer
Strategies and Air Standards Division (MD-12)

As requested, I have reviewed the write-up on the proposed SO₂ significant harm levels. The proposed changes will cause difficulty in trying to incorporate them into the Pollutant Standards Index (PSI) framework. The PSI relates health descriptor words with normalized PSI values ranging from 0 to greater than 500. The key breakpoints for the PSI index are as follows:

Index Range and Description Category

0 to 50	"Good"
51 to 100	"Moderate"
101 to 199	"Unhealthful"
200 to 299	"Very Unhealthful"
300 and above	"Hazardous"

For each pollutant, a subindex is calculated from a segmented linear function that transforms ambient concentrations onto a scale extending from 0 through 500, with 100 corresponding to the primary standard and 500 corresponding to the significant harm level. In order to achieve relative uniformity for intermediate PSI values of 200, 300 and 400, the health effects are approximately normalized by using the breakpoints corresponding to the alert, warning and emergency levels in the example episode criteria. A major underlying condition in developing these segmented linear functions is that the pollutant must have a uniform averaging time for each of the breakpoints, that is the primary NAAQS, the alert, warning and emergency levels and the significant harm level.

The proposed change to the significant harm level for SO₂ causes a major difficulty. You cannot have a segmented linear function for SO₂ whereby the primary NAAQS has an averaging time of 24 hours and the significant harm level has an averaging time of 1 hour.

For example, on September 30, 1979, site number 030180004F02 had a 1-hour peak concentration of 1.56 ppm and a 24-hour concentration of 0.11 ppm. Based on the 1-hour observation, the PSI value would exceed 500 and the air quality deemed "hazardous," while the PSI value for the 24-hour average would be 86 and the air quality deemed "moderate." This creates a situation, whereby the public is advised that air quality at one point in the day has reached the "hazardous" level, but at the end of the day the air quality is deemed "moderate." Clearly, under these conditions the air quality would have to be reported as "hazardous" for the day, even though the standard was not violated. This situation does not occur for any other pollutant included in the PSI.

If the short-term primary standard is reaffirmed as a 24-hour average and the significant harm level is redefined as a 1-hour average, there will be serious discontinuities in the reporting of the index. These discontinuities depend upon the averaging time assigned to the alert, warning and emergency episode levels. If, for example, the averaging time for the episode levels is defined as 1 hour, then PSI values greater than 200 can be reported, but PSI values between 100 and 200 cannot, because the NAAQS is expressed as a 24-hour average and, in this example, the alert level is expressed as a 1-hour average. One must keep in mind that the index converts air pollution measured in parts per million or micrograms per cubic meter into a normalized PSI value. In this example, what happens when a 24-hour value greater than the 24-hour standard is measured, but the highest hourly value occurring during the measured 24-hour period does not exceed the 1-hour alert level? There is no path connecting the 24-hour standard with the 1-hour alert level, so that no PSI value can be generated.

To resolve these problems, I would recommend that two sets of 1-hour and 24-hour standards, episode levels and significant harm levels be proposed. Two subindex functions would then be incorporated into the PSI for SO_2 : one for 1-hour averages and one for 24-hour averages. Both would have PSI values ranging from 0 to over 500.

If a short-term 1-hour standard is not possible, the problem could still be resolvable if two sets of episode levels and significant harm levels could be proposed. In this way, the PSI subindex function could be defined as the maximum PSI reading of two subindex functions: one based on 24-hour averages with a range of PSI values of 0 to over 500 and the other subindex function based on 1-hour averages with a range of PSI values from 200 to over 500. The 1-hour subindex would not be considered unless the alert level was exceeded.

The second proposed change to create a combined $\text{PM}_{10} \times \text{SO}_2$ significant harm level with a 24-hour SO_2 concentration of 500 ug/m^3 triggered when PM_{10} levels are at or above 600 ug/m^3 , adds nothing to the PSI reporting scheme, except possibly creating some confusion. The proposed PM_{10} significant harm level is already set at 600 ug/m^3 . This means that when

that level is reached, the public is told that the air quality is "hazardous" and the PSI value is 500. It does not make any difference what the SO_2 level is, the PSI value remains the same. In order for the $\text{PM}_{10} \times \text{SO}_2$ significant harm level to have any impact on index reporting, the PM_{10} value should be lowered to take into account the incremental effect of having SO_2 . Further, if that step is taken we will need episode levels and a primary NAAQS equivalent for $\text{PM}_{10} \times \text{SO}_2$.

I will be happy to get together with you to resolve the issues raised, keeping in mind that we will need alert, warning and emergency levels to go along with the significant harm levels.

cc: R. Neligan (MD-14)
S. Sleva (MD-14)
J. Haines (MD-12)
J. Sableski (MD-15)